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28 June 1984

East Europe Report

SCIENCE & TECHNOLOGY

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CONTENTS

ADVERTISEMENT FOR RANGE OF COMPUTER PRODUCTS

Sofia IKONOMICHESKI ZHIVOT in Bulgarian 2 May 84 p 14

[Text] The IZOT State Economic Trust in Sofia and the Orgtekhnika Combine in Silistra offer new developments on products which have been accepted very well in our own market and on the international market as well. Many of the products are exported to the USSR, Poland, Czechoslovakia, Hungary, East Germany, Cuba, Turkey, Romania and other countries.

The combine expands its range each year with new products which are adopted rather quickly. By the end of this year, Orgtekhnika is expected to supplement its production program with a series of new developments:

The IZOT 0220 M 2 Microcomputer

--a powerful system, easy to use; it is designed for adjusting users' programs in developing program-oriented microprocessor systems on the basis of the SM 600 microprocessor family. The IZOT 0220 M 2 also permits internal circuit emulation in the PPZU user programming system of the 12716 and 12732 types for connection to external systems through serial interface IRPS and S2.

The IZOT 0220 M 2 has program capability with the IZOT 0220 M 1 microprocessor.

Basic modes of operation:

--automatic,

--complex.

Automatic Mode Functions:

--inputting text on the screen,

--printing the information displayed on the screen,

--memory test in the main memory,

--reading a perforated tape,

--duplication of perforated tape.

Complex Mode Functions:

The IZOT 0220 M 2 has a built-in operating system for input and adjustment of programs, which allows the following:

--indication and modification of memory cell contents,

--indication and modification of program access register contents,

--printing the contents of a file with preliminary set limits,

--starting user programs,

--inputting control points (up to 8),

--stopping an address,

--tracing the execution of the user program,

--working with the IZOT 0220 disk operating system.

The configuration of the IZOT 0220 M 2 includes:

--alpha-numeric and functional keyboard,

--electron-beam monitor with the ability to identify alpha-numeric information contained in 24 lines of 80 characters each,

--ZUGMD--two,

--printer--one.

The IZOT 0220 M 2 is designed as a workplace consisting of 2 interfaced modules. The product is designed for round-the-clock operation.

Power supply: 220 W - $\frac{10}{15}$ percent.

Size: 7-0 x 770 x 350 mm without monitor, operator console and paper feeder.

Weight: 250 kilograms.

The ELKA 160 Electronic Calculator

--designed for economic calculators with numeric indication is processing economic and statistical information at production enterprises, banks, commercial networks, and educational institutions.

Functional capacities:

--addition, subtraction, multiplication, division, percent, percent ratio, power, operations with one free memory, reciprocal memory;

--chain execution of the operations;

--the possibility of automatic execution of the operations with a constant operand;

--power supply: electric network 220 W $\pm \frac{10}{15}$ percent, 50 H $\pm$ 1H through an adapter;

--weight: about 359 grams;

--size: 120 x 170 x 40 mm.

The ELKA 93 Electronic Cash Register for Hotels

--maintains complete daily tracking and provides an account of the financial and accounting activity in a hotel.

The ELKA 93 has alphanumeric indication. Printing of output data is handled by the IZOT 340 device on bond and control tape and on alphanumeric mosaic print through the IZOT 6602 S receipt printing module.

The cash register processes each hotel visitor's balance individually, memorizes sums deposited, and in addition can keep track of room occupancy. It has a console programming mode, so the cash register can be adapted for a specific commercial site, according to the rates, category, number of rooms, and so forth.

Using the cash register is possible by the implementation of a coding key, which determines the modes: accumulation, programming, clearing of registers, storing, and printing accounts.

The ELKA 93 provides information storage when the power supply is down. When it is connected again, all interrupted operations are finished.

Basic technical data and characteristics:

--size: 410 x 480 x 490 mm without the IZOT 6602 S receipt printing module;

--weight: 16 kilograms without the IZOT 6602 S;

--number of operations--two;

--number of accumulated registers for type of payments--15 per operator;

--number of accumulated registers for type of service--up to 99;

--number of accumulated registers for type of rates--up to 97;

--number of accumulated registers for guests' nationality--up to 99;

--individual balances for the customers, depending on the number of services, the rates, their nationality--80 registers at a minimum;

--indication--14 digit, alphanumeric.

For more information and business contacts:

Orgtekhnika Combine-Silistra

Operator 2-67-11

Director 2-28-87

Telex 64576

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CSO: 2202/9

SM 1604 VIDEO TERMINAL DESCRIBED

Sofia TEKHNICHESKO DELO in Bulgarian 28 Apr 84 p 4

[Article by Engineer D. Atanasov]

[Text] This terminal is designed to be included in the make-up of teleprocessing systems. In addition, it could also be used as an off-line and an on-line terminal, and as a master terminal (operator terminal). It can be used for preparing, editing, and printing text. It can operate in a calculation mode, in which it carries out the four basic arithmetic functions; it can also be used in technical diagnosis systems, for control of some productions, scientific research, information services, and so forth.

These capabilities of the SM 1604 demonstrate its versatility as a video terminal. It is compatible with most types of mini- and microcomputers. If the users have special requirements, the modifications which are necessary for adapting the video terminal to the appropriate computer system are easily and quickly done, because it has a modular microprocessor structure. It has been created on the basis of a Bulgarian microprocessor family. It consists of three separate units: a basic unit with a video monitor built into a cellular polyurethane box, a keyboard, and a printer. Two basic modes of operation are possible: off-line and on-line. The off-line mode is used for the preliminary preparation of data to be input into the machine. The advantages which the video terminal provides in editing a prepared text are especially well demonstrated here. In the on-line mode, the SM 1604 exchanges information with mini- or microcomputers. The exchange is semi-duplex or duplex. A "stop-screen" can be applied in the process of receiving information. In this case, the information received is retained until necessary, and the loading of new information into the buffer stops. If the operator gives a command, new information could also be received, in which case the lines in the screen move vertically in order to provide space for receiving one line of new information. If desired, all the information on the screen could be printed by the printer. There is also an automatic printing mode available, which prints only the information between the beginning and a position determined by the operator.

In order to determine the proper functioning of the terminal, an internal test is used, which is executed immediately or after plugging into the power supply. In the case of irregularity, an error code appears on the screen. This allows

the operator to determine the place of the program and its causes by using tables designed specifically for this purpose.

The experience accumulated thus far, as well as the results of the tests conducted by foreign buyers, show complete or almost complete compatibility of the SM 1604 with different types of mini- and microcomputers. It has all the functions contained in the best, similar video terminals made by leading firms, which are manufacturers of computer hardware (DEC, for example). It was developed at the Central Institute for Computing Technology in Sofia, and is manufactured serially by the Plant for Memory Devices in Veliko Turnovo.

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HISTORY OF RESEARCH, DEVELOPMENT OF PERSONAL COMPUTER

Sofia TEKHNICHESKO DELO in Bulgarian 28 Apr 84 pp 12, 13

[Article by Engineer Kiril Yanev, chief specialist on information science at the Sofia-Press Agency, aided by an authors' collective, including Engineer Ivan Marangozov, Engineer Georgi Zhelyazkov, Engineer Petur Petrov, Engineer Tsano Dobrev, Engineer Khristo Khristov: "PRAVETS Personal Computer"]

[Text] Shortly after its appearance, the IMKO personal computer literally took hold of the minds and hearts of a surprisingly broad public. Starting with scientific and administrative workers, engineers, technologists, and students, and ending with children--for all of them, the IMKO turned out to be not only a universal device for informational messages, but also an intelligent and discrete teacher, a worthy and intelligent partner, and last but not least, a clever and useful toy that attracts children like a magnet. The enormous increase in consumer demand, which has resembled an avalanche, is solid proof of what has just been said.

In order to evaluate correctly and more completely the work of the collective which created the IMKO, we must go back in time.

1979

The State Committee for Scientific and Technical Progress, in a quite generally formulated proposition, asked the Institute for Technical Cybernetics of the Bulgarian Academy of Sciences to "create a small computer on the basis of microprocessors." Such a formulation is understandable because the situation in the world computer arena at this moment is quite confused and complex. The demand for microcomputers is tremendous, they are in the wind. They are produced in great quantities, and experts predict a glamorous future. Interest in similar large computers has not faded, either. The press has already published data about the production of so-called microcomputers, which are even smaller than mini-machines. They are produced, however, by small, almost unknown firms and most of the specialists do not believe that such technology has much of a future. A very solid argument was raised in support of this fact--not a single large firm manufacturing computers worldwide was interested in microinformatics back then.

The Marangozov-Zhelyazkov-Petrov trio had the task, which was not easy, of laying the foundation for microinformatics here in Bulgaria, even though it had not made an impression in the most developed countries, in terms of computers, in the world. The first result was already available at the end of 1980--three Bulgarian microcomputers appeared, christened by their creators IMKO (acronym of Individual Microcomputer). The prototypes were immediately approved by the State Committee for Scientific and Technical Progress.

Serial production is begun; however, there are still many people, including highly qualified specialists in the field, who do not pay any attention to this progressive novelty, to this undoubted success. What is more, this innovation is not taken seriously, the team is referred to as a bunch of hackers.

1980

The first 50 IMKO 1 computers are produced and 25 lucky organizations, selected by the State Committee for Scientific and Technical Progress, purchase them immediately. The reason for this is that microcomputers dazzle the users with their universal capabilities, easy operation and, of course, low price. Although the production was not a large one, in practice it proved that the design ideas chosen for the IMKO microcomputer system were correct. The following requirements have thus been observed:

--development should be in terms of an open system with modular organization and universal nature of application;

--it should be produced by using available, cheap, and reliable materials and components;

--it should be built in compliance with production capacities and technologies in our country, and with our existing specialized cadres as well.

The IMKO 1 meets all of the conditions specified above. Work on preparing an improved version for serial production had already begun.

Let us look again, even for a short time, at the horizon of computers, in order to adjust our clocks and judge, for the sake of merit, the timely and creative insight and intuitiveness shown by Marangozov and his team.

Only by the end of August during the same year of 1981 had the longest-lived developer, introducer, and manufacturer of computer systems of any size in the world so far, IBM, just produced its first personal computer. As one of the vice presidents of the giant multinational company would later explain, apologetically: "We realized what was happening only when foreign computers had begun to appear in our own offices and proved their vitality."

1982

The first 250 of the already improved version of the microcomputer, the IMKO 2, have been produced; this includes an original processor plates, an original feed

reel, and a keyboard. The lucky recipients this time are divisions of the Ministry of Education. At the same time, intensive preparation for serial production of the IMKO 2 has begun at the Instrument Building Plant in the city of Pravets; the machine's name is the PRAVETS 82. The baton has been passed here to engineers Tsano Dobrev and Khristo Khristov. The question of serial production of peripherals for the IMKO 2 has been raised--minifloppy disk devices, video monitors, printers, and plotters are needed. The "small" personal computer has given a "large" stimulus to new productions and industries.

1983

The IMKO 2 is already a hit and an undoubted leader in microinformatics in Bulgaria. The Center for Technical Cybernetics and Development [TsTKR] has produced 300, and the Instrument Building Plant in Pravets, 500. The demand surpasses production capacities many times over.

1984

Four years have passed since the task of completely implementing the system and ensuring its development was formulated. The circle is closed.

This is, generally speaking, the short history of the IMKO microcomputer system. There is no doubt that the collective that designed, developed, and implemented the first Bulgarian personal computer is worthy of the Dimitrov Prize.

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ADVERTISEMENT FOR REFINERY PRODUCTS

Sofia TEKHNICHESKO DELO in Bulgarian 28 Apr 84 p 14

[Text] The Leon Tadzher Oil Refinery in Ruse, holder of the Red Banner of Labor medal.

This refinery specializes in the production of high-quality lubricants, white oils, medical vaselines, lubricating coolants, canning preservatives, and plastic oil bitumenous compounds which have a high melting point.

The products of the Leon Tadzher Oil Refinery in Ruse are well accepted on domestic and international markets. During this year the range of the enterprise was expanded by adding the following new products:

High index hydraulic oils--operating level Mkh-V, viscosity rank 22, 32, and 46:

They are designed for hydrostatic systems operating within a temperature range from -35° C up to 100°C. They have high quality agents for antipocketing, antiwear and deemulgation.

Oils for guiding surfaces of metal cutting machines--type MNM-32, MNM-68, and MNM-220:

These are special oils for corrosion protection of horizontal and vertical guiding surfaces of lathes, cutters, polishing machines, coordinate piercing, copying and other metal cutting machines with high precision.

Oil for Pretsizol precision machines:

It is designed for lubricating precision machines with high rotation and low drag, such as sewing machines, office machines, and other control and measuring instruments. It has good lubricating, antioxidation and anticorrosion properties.

Emulsol LT-11:

A lubricating-cooling concentrate for preparing 3 to 10 percent milk-white water emulsions which are used during different operations of metal processing--

piercing, turning, cutting. It is manufactured in two versions--for ferrous and for non-ferrous metals.

Rezinol D-21 deep piercing oil:

This is a special lubricant-coolant liquid of the "active" type, which is used for processing steel and cutting alloys (shaving removal) during the process of deep piercing. With the proper use of this product, the productivity of labor is increased, the durability of the cutting instruments' operation is prolonged, and high quality of processed surfaces and increased size precision is guaranteed.

Polishing Oil MSh-1:

A non-emulgating lubricant-coolant liquid containing chemically active additives which ensure the high operating qualities of this product. It is used for polishing and honing construction steel alloys and high-alloy steel.

Rezinol 21 and Rezinol 31:

Highly effective lubricant-coolant liquids containing carefully selected composition additives. It is recommended for use in the cutting of carbon steel, construction steel alloys, and stainless steel on automatic lathes, as well as for separate operations of thread-broaching cutting (with tape, cutters, and others), stretching, final serrating, and piercing.

The Rezinol 21 and Rezinol 31 cutting oils provide for high productivity of labor, increase the durability of the cutting tool, and guarantee high quality in the processed surfaces.

For information and business contacts:

Telex 62569

Telephones:

operator 44-31

director 4-04-54

vice director 4-03-20

sales 4-06-87

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NEW CNC MACHINE-TOOL SYSTEMS DESCRIBED

Paris INDUSTRIES ET TECHNIQUES in French 10 Apr 84 p 17

[Article signed 'M.A.']

> [Text] Machine-tools in the German Democratic Republic are decidedly entering the electronic era: flexible turning cells, machining centers with automatic feed and dimension control, etc. Foundry is not going to be outdone; it is getting automated, too.

The Leipzig Fair is the best opportunity we have to discover the achievements of the GDR, which is often looked on as the leader among East European countries as far as technology is concerned. At the recent March session, the main combines (consortia of firms in the same sector) were represented; machine-tool, foundry, metallic engineering and building combines.

As far as machine-tools are concerned, the GDR is renowned for its expertise in mechanics: sturdiness, precision reliability. Its weak point: microelectronic controls. This year, it demonstrated in all sectors its desire to enter the electronic era. NC [numerical controls], CNC [computerized numerical controls] and flexible cells are beginning to be developed. The most sophisticated unit was presented by the "8 May" factory of Karl-Marx-Stadt. It is a flexible turning cell equipped with an IR-2-P gantry robot, a palletized automatic part feed and removal station, and a CNC-H-645 manual-entry control. This cell is called DFS2/2-CNC and is built around a Niles lathe. Auxiliary systems have not been neglected: safety guards, chip-removal devices. One of the largest machine-tool manufacturers in the GDR, Fritz Heckert, was introducing its new FCW-630 manufacturing cell based on the CW-630 machining center. It is equipped with automatic part feed/removal, part dimension and clamping-position control, and a thyristor control for the main spindle.

Foundry, too, is getting automated: the KMAY-80 is an automatic device specially designed to manufacture hollow shells and shell-cores. The machine is equipped with two working stations designed to be operated simultaneously. Sand is supplied through a single injection head pivoting around an axis to adapt itself to the two molding sections.

Productivity Gain: 140 Percent

All operations are programmable and any malfunction is detected by an electronic system operating continuously. According to Gisag, the productivity gain obtained with these features can be estimated at close to 140 percent compared with a comparable single-station machine. To make a core (maximum mold dimensions: 1,000 x 800 mm), it takes no more than 29 seconds for a full cycle. The price for such a machine adapted to small-series operation is DM 400,000. There is also another molding machine that will automatically fill the mold with sand after mixing it. The large-output mixer of the Axmda 20 produces 18-20 tons of sand per hour. The dry sand is stored in a hopper and fed into the automatic binder-measuring device. Programming is done through emulation and cassette recordings provide prompt operating-mode changes.

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ERRATUM: This article republished
from JPRS-ESA-84-011 of 24 April 1984
to provide text for photo.

GERMAN DEMOCRATIC REPUBLIC

CASSETTE MAGNETIC TAPE UNIT KMBE K 5261

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 19 No 10, Oct 82 inside back cover

[Advertisement]

[Text] With the 5261 magnetic tape cassette technology, high performance recording and playback machines are offered as original equipment manufacturer components for data processing and small computer equipment systems.

They implement the international recording method ECMA 34 (in compliance with ISO 3407).

Internationally standardized digital cassettes can be used as a storage medium with these machines.

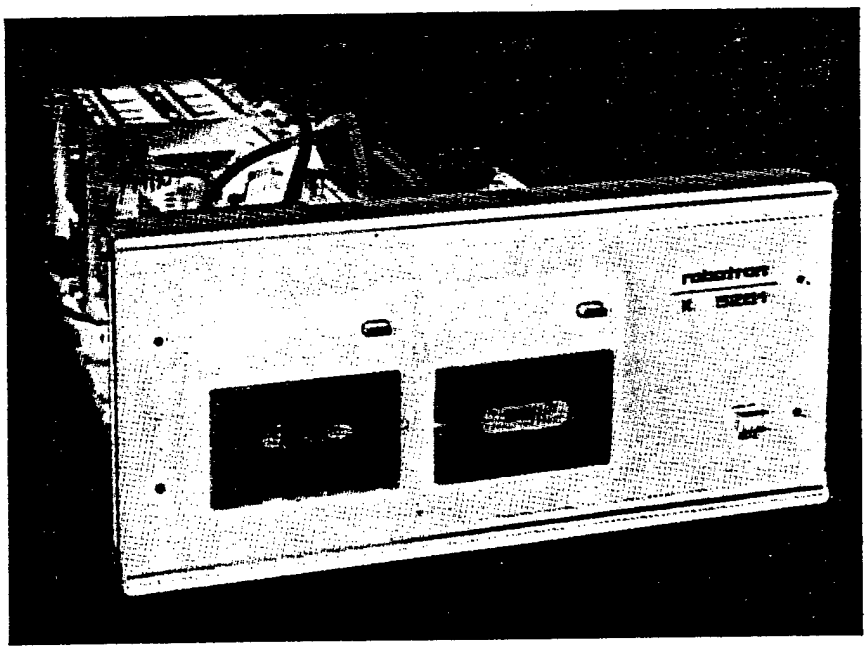
The tape recording unit KMBE ROBOTRON K5261 combines two KMBG K5200 with a power supply unit within a 19-inch plug-in unit and contains control electronics. The KMBE can be delivered as a built-in unit or a portable device. The same conditions apply for the connection of the KMBE to computers and control units as for the KMBG K5200. This control unit implements the SKR (System of Small Computers) interface IFSS [expansion unknown] among others.

The KMBE K5261 can be connected to the CM4 and is listed in the SKR under the registration no CM5206.

The device is a built-in unit in a 19-inch plug-in unit (SKR plug-in unit).

Tape speed	v_1 = 19 cm/s v_2 = 38 m/s convertible within device
Bit density	32 Bit/mm
Start-stop gap	normal 20.3 mm
Recording and playback speed	6×10^3 Bit/s 12×10^3 Bit/s

Exporter: ROBOTRON EXPORT-IMPORT, VEB Foreign Trade Enterprise of the GDR, GDR--1080 Berlin, Friedrichstrasse 61



CSO: 2302/31

APPLICATION OF SCIENCE TO ECONOMIC PROGRESS ASSESSED

Increased Outlays for Science

Warsaw PRZEGLAD TECHNICZNY in Polish No 13, 25 Apr 84 p 22

[Article by Witold Ochremiak]

> [Text] What do scientists work on and how useful is their work? Nearly everybody asks this question and expects that people who are educated and wise will provide help in solving present and future problems. It is commonly believed that scientific research and studies ought to bring economic effects and benefits to society. Scientists are often treated with impatience and even annoyance, because their actions are not effective enough in removing our numerous difficulties and troubles. What do scientists have to say about it, what are their opinions about the state of science in our country and about the relation between their actions and the practical needs of the economy and society?

The Sejm Commission on Science and Technological Progress has taken up the subject of basic research and its influence on the development of applied research, using materials prepared by the PAN [Polish Academy of Sciences] and the MNSzWiT [Ministry of Science, Higher Education and Technology]. The evaluation of these materials and deliberations on the essential functions which basic research fulfills in society were placed in the hands of a subcommission consisting of the deputies: professors Jan Szczepanski, Andrzej Werblan, Kazimierz Orzechowski, Dorota Simonides, and Tadeusz Koszarowski, i.e. a sociologist, a political scientist, a lawyer, a philosopher, and an oncologist. This had its bearing on the definition of the concept of basic research, and in a certain diminishing of the significance of material and organizational conditions necessary for proper development of this research.

In reporting the opinion of the subcommission, Prof Jan Szczepanski observed that official documents use the term "science" with three different meanings: as a system of knowledge, as a process of creating this knowledge, and as a system of institutions and people carrying out research. The uses of these meanings make it more difficult to formulate a policy on science and to understand correctly the concept of research. In regard to the definition

of basic research, representatives of technical sciences, Prof Jan Kaczmarek, the vice chairman of the NOT, and deputy Prof Mieczyslaw Lubinski, presented a point of view different from that of Prof Jan Szczepanski. Prof Jan Kaczmarek expressed the view that if by basic research we understand only cognitive research, creative work most valuable for the economy would remain outside of the sphere of interest of the authorities and society. He was talking about the sphere of technical sciences, in which basic research is nearly always connected with applied research and which constitutes a part of it.

Considerable differences in views arose regarding the participation of the organizational and administrative factors in scientific research. Prof Jan Szczepanski said that scientific results are determined by the quality of the scientific personnel carrying out the research rather than the quality and organizational forms of managing science. An excess of organizational forms makes research more difficult and sometimes paralizes it altogether. Prof Jan Kaczmarek, on the other hand, believed that in establishing the state of research we cannot concentrate exclusively on the evaluation of its level, but we must also evaluate the material and organizational conditions which promote or hamper the speed and range of this research. The need for a thorough evaluation of the various spheres and divisions of science and research carried out within their framework, absent in the materials submitted by PAN and MNSZWiT, was not disputed.

From this stemmed the important issue of the methods of managing science. Science is certainly not created in state committees, ministries and PAN presidiums, as Prof Jan Szczepanski pointed out; nonetheless, we cannot accept the opinion that the creation of a State Committee on Scientific-Technical Progress, requested by PAN authorities, among others, is a misunderstanding. Such an opinion is probably dictated by fear of an overgrowth of organization and management in the sphere of science, and stems from a lack of detailed explanation of the essence of such a coordinating organ, whose major function would be inspirational.

It is important also from the point of view of organizing the flow of information and subject coordination between the activities of particular scientific institutions. This was emphasized by Deputy Prof Jan Janowski. Many institutions have no idea what goes on in other departments working on the same set of problems. He suggested that reports conferences of PAN committees be open for all specialists in a given sphere.

The need for coordinating actions and research work was further substantiated by Associate Prof Dr Zbigniew Smieszek, representing the industrial Institute of Nonferrous Materials. Scientific and technical progress requires planning and organization. This function is fulfilled everywhere by committees on scientific-technical progress, which also regulate economic-financial systems and the financing of research. Many Western countries are restructuring their economies, state interventionism is growing, and industry based on basic research tied to applied research is formed. The most telling example of this is microelectronics. What is being practiced the world over in our country continues to be a subject of theoretical discussions. This is a point of our weakness.

Secretaries of particular PAN divisions acquainted the deputies with the main problems of research pertaining to these divisions, focusing, however, on the conditions of conducting research.

Resolutions concerning an improvement in the material conditions necessary for a normal functioning of the sphere of science are not being implemented. Expectations concerning the development of the material base of science in the past decade have not been met. In some divisions of science the equipment is over 20 years old. Three-fourths of the scientific-research equipment is already fully depreciated. The majority of scientific institutions have no funds for salary increases. The average salary is not higher than the average for the whole of the economy. This results in losses of scientific personnel. In departmental scientific-research posts, the personnel has declined by 21 percent, likewise in higher education. Mostly young people are leaving.

If we are to achieve progress in the sphere of technology vitally important to the economy, we must increase outlays for science, including basic research. However, the amount of funds devoted to science in the national income fell from 2.1 percent in 1978 to 1.1 percent in 1984, even though the Second Congress of Polish Science postulated increasing this amount to 4 percent.

Drastic disproportions in salaries result in a negative selection of scientific personnel and losses of engineering-technical personnel. The obligatory payments for the PFAZ [State Fund of Vocational Activization] have a very negative impact on a proper functioning of research posts, are maladjusted to the conditions of carrying out research, and lead to a shortening of research cycles at the cost of their quality. Utilization of research results is connected above with the mobilization of pre-innovational mechanisms in the economy, which has yet to take place.

Scientific milieus every year are trying to answer at the sessions of the PAN General Assembly whether the results of scientific research are commensurate with current needs. In principle the answer is positive, although not with regard to society's expectations. State centers also differ in their evaluations of the input of science in general economic and social progress. This confirms the need to make an objective evaluation of scientific-research posts and groups.

Accepting the comments on his pronouncement, Prof Jan Szczepanski referred to his many years of carrying out scientific work in various different systems of science management. "I have come to the conclusion that out of the three factors: human, technical and financial, the human factor is the most important one. If man does not feel an inner need to express himself, even the best conditions will not force him to create anything valuable due to the fact that he will simply have nothing to say."

In the course of the discussion it was recalled that for many years PAN committees submitted numerous studies and evaluations by experts, which unfortunately were not applied in practice by our country's economic and social

administration. Such studies continue to be submitted and their effects continue to be negligible. In bringing this subject up, Prof Mieczyslaw Lubinski asserted that the currently implemented economic reform was based only in a very minor degree on the results of scientific research and did not apply to science at all.

The necessity for creating a bridge and a common language between scientists and representatives of the authorities, who ought to request expert evaluations, forecasts, and scientific opinions, and ought to study them closely, was asserted. This process can be speeded up because nearly 70 percent of the management of the economic and social life consists of professors.

Scientific, Economic Progress Related

Warsaw PRZEGLAD TECHNICZNY in Polish No 13, 25 Apr 84 pp 18-19

[Interview with Dr Aleksander Kopec, chairman of the Chief Technical Organization, by Roman Dawidson]

[Text] [Question] Technological progress is the element of our economy which, although theoretically supported by everybody, for many years has been encountering many difficulties. What conditions, in your opinion, must be met for the results of science and technology to be applied by the economy?

[Answer] Technological progress is a much more complicated phenomenon than an improvement of industrial production itself, as is believed by many people in their daily practice. New technological solutions function first in the sphere of imagination, then in the economy, and finally find their reflection in social, political and cultural systems.

Too narrow an understanding of technical progress causes incorrect social evaluations of the work of engineering personnel. It also leads to formulating such erroneous evaluations as, for example, "Why do we need color television sets if farmers are lacking pitchforks?" or "Technological progress and the development of industry destroy the natural environment." Such opinions are formed only when the achievements of scientific-technical progress are not implemented in economic practice in a complex way, either due to a lack of knowledge, or to a lack of funds. Thus a justified question arises: Is technology a product existing for itself, or a general good measured by social, moral and cultural criteria? This is not a rhetorical question, but a very important one in the sphere of technological and economic policy. In socialist countries the development of science and technology is one of the elements of planning by the ruling party and appropriate government agencies, with the participation of many social-professional and scientific-technical milieus, and the object of it is to socialize to the maximum the problems of technological progress and bring its essence closer to society. This, however, does not fully solve the problem because in practice we often see cases when enterprises direct all their possibilities and resources of manpower, equipment and funds more willingly to the execution of tasks which have already been resolved technologically. Every innovation which requires experiments in the period of its implementation is put aside because it dis-

turbs the rhythm of production. In this situation, old methods prevail because they do not endanger the execution of the plan and the winning of various awards and bonuses, and do not lower the already established social prestige of particular individuals...

[Question] What, then, ought to be changed?

[Answer] We must create conditions for a creative activity of dedicated technical personnel and use more effectively the mechanisms of economic enforcement in introducing innovations in enterprises, so that one can participate directly in the achieved results depending on one's input of skills and talent. As long as there are no economic mechanisms creating technological progress, the efforts in that direction will always be incomplete and insufficiently effective. Scientific-technical progress must be a factor in the economic activity of enterprises that is taken into account and enjoys full rights.

[Question] On what should the greatest attention be focused?

[Answer] We ought to use in an organized way both the scientific-research posts and specific individuals in order to carry out a nationwide survey of: the structure of products, the technological processes, the methods of production, the analyses of organizational systems, the structure of production from the point of view of lowering material-intensiveness, a decrease in the use of energy, a utilization of domestic raw and other materials, greater export attractiveness and removal of obsolete products and technology. Scientific-technical associations [SNT] existing in enterprises could play a helpful and important role in the survey.

[Question] Do you not think that people have had enough of all kinds of surveys already?

[Answer] We all feel distaste for formal or very formalized activities, nevertheless I believe that a preparation of such a report about the current state of our economy in connection with certain gains both for talented engineers and for enterprises is on target. The importance of these problems is still insufficiently known and appreciated. Because of this, in our opinions we continually stress the absolute necessity of a systemic and all-round treatment of the questions of socio-economic development and a better selection of the methods of realizing the adopted assumptions. Technology is not an abstract, it must be seen as a fragile social process which, through imagination, is transformed into a concrete product which, through its use, again affects the imagination, and therefore each action must be carefully programmed. It is important "what to do," but even more important is "how to do it more effectively." In the conditions of the economic reform we must also answer the question of how to "divide the results" in a just and objective way.

[Question] We all agree with these statements in theory, nevertheless in practice things look altogether different.

[Answer] I strongly fear that this problem is neither appreciated nor understood in the current systemic solutions of the economic reform. It is easy to show that those enterprises which aimed at using their own technological innovations in the hope of achieving better results could be penalized by an increased rate of profit and an appropriate tax increase. The situation looks more promising after the change of the tax from progressive to linear in the beginning of the year. Nevertheless it still does not resolve the problem. The simple reason for it is that the economic solutions adopted in the reform are of "quantitative-market" character and are not based on the principles of a free market of goods, which does not exist in our country and will not exist for a long time.

As long as we ignore in our system the differences between profit derived from honest work, expressed in technological innovations, and the lowering of proper costs deriving from price manipulations, we shall not have a natural need for technological progress and for talented engineers in enterprises. Much has been done recently to improve within the framework of the reform some mechanisms of the functioning of the national economy. More effective principles of management, however, are still awaiting their theoretical and practical examination. I have in mind particularly the system of incentives, which must be the foundation for economic and social principles of management in every industrial enterprise and scientific-research institution. A similar situation exists in the questions of social efficiency of work or quality of production.

[Question] What role would you assign to the engineering-technical personnel and its organization, namely the Chief Technical Organization [NOT]?

[Answer] The intelligentsia, broadly understood, has many important functions to fulfill in a socialist state. At the head of the tasks I would place the intellectual leadership of the working class by cultivating and developing those national characteristics which have sustained the test of time and are sort of timeless, and the new values and contents of our socio-political formation which we call socialism, namely: social good, work in a collective, personal and national dignity, and social justice.

The next important task for the intelligentsia is to fill production relations with defined contents of class character, in which the concepts of "freedom," "democracy," and "socialism" are explicitly defined and cannot be understood as universal or abstract concepts.

The usefulness of the intelligentsia as a social layer determines its ancillary relation toward the working class and the class character of its attitudes, actions and evaluations of events. In the stormy moments of our country's development, the decisive majority of the technical personnel read correctly the pressure on the barometer and did not mistake the direction in which the magnetic needle pointed on the stormy stage of political events.

For this reason engineers today are more necessary than ever before. This adds the necessary sense to their work. Enterprises, facing the complex and difficult technical and technological problems, turn first of all to their

skills. The ones who can meet the challenge gain the authority over those around them. Apparently there are many such engineers.

[Question] What are the other tasks?

[Answer] I see other long term possibilities for using our research and scientific-technical personnel, but a certain regrouping of forces and redistribution of tasks and funds are necessary.

I think that it is high time to intensify work on the assumptions of the scientific-technical policy for the 'nineties and to work on new designs and technologies for the second half of the 'eighties.

Real technical-economic effects are achieved thanks to new and improved designs and new generations of technology which assure a reduction in the use of materials and an improvement in the performance and functioning of products. The practice of many past years has shown that these important problems cannot be solved by appeals or by magic invocations. What is needed is peaceful, hard and creative engineering work. At times I have the impression that we either do not want to, or are unable to differentiate between crisis phenomena and ordinary chaos!

[Question] Can this be achieved despite the low esteem which the enginneer's profession is held today?

[Answer] Unfortunately, it cannot. If a high level of economic and socio-political and cultural life is to be obtained, a high or even very high standing of the engineering profession is necessary. If the engineering profession is to achieve a high standing, many complex questions need to be solved in the next few years. First of all, it is necessary to create real possibilities for steadily raising one's qualitications and to change the system of remuneration which ought to reflect the knowledge, talent, experience and actual conditions of work. I am fully aware of the fact that it is difficult to speak about personal dignity without accompanying decent pay for work. The technical intelligentsia should also be assured greater participation in the country's sociopolitical life. We are trying to renew and restore the full meaning of the concept of professional ethics of the engineer and the technician, to instill the sense of the ancillary role toward society, and a civic and patriotic attitude of joint efforts for the good of the country.

[Question] Anything more?

[Answer] We also would like to take up the preparation by the NOT Scientific-Technical Associations of the annual reports concerning selected products and technologies, which because of low technical parameters ought to be withdrawn from production. We could carry out periodic surveys of scientific-technical achievements in order to establish their place in central plans. I also see the usefulness of assigning greater powers to the NOT SNT to prepare the assumptions of state legislative acts which are of particular importance for Polish science and technology.

[Question] On whose help are you counting?

[Answer] I believe that the planned state committee for scientific-technical progress ought to be very helpful in improving the effectiveness of scientific-technical facilities. The concept of such a committee is just and the engineering milieu of the NOT supports the government's efforts in this direction, despite numerous opposing motions. The effectiveness of the economic development depends on the role and contribution of technical progress in creating material goods and national income. If we want to shape the strategy of intensive economic development in the next few years, we must create proper conditions for the development of science and technology in a broad area of activity.

In view of this we ought to comprehensively improve and examine organizational and economic problems and the incentives and wage problems of the creators of new technology.

[Question] Why do you believe that the new office will solve this?

[Answer] A new office will not replace the technical creativity of engineers and professors, nevertheless I believe that it will be concerned with the conditions necessary for their creativity.

[Question] Why cannot this be achieved by the present departments, the Ministry of Science, Higher Education and Technology, for example?

[Answer] MNSZWiT above all ought to provide good training for engineers and various forms of raising their qualifications in the course of their professional work. We know from experience that even a small conflict in an institution of higher education pulls the ministry away from operational and strategic tasks of technology and science.

[Question] What tasks do you believe are the most important at the present moment?

[Answer] On the basis of the opinion of the milieu which I represent, I intend to submit a proposal that a resolution be prepared concerning the creators of material culture and new technology. In the light of the law on creators, we want the engineer to be treated in the same way as an artist, a writer or an architect.

The recognition of scientific-technological progress within the framework of the economic reform ought to be the main factor of intensive development. In particular, the complicated process of restructuring Polish industry requires such a vision of its role. The mechanisms of the reform must take into consideration this imperative and must generously reward outstanding technical achievements bringing large and measurable benefits. The world's economic history provides many examples of the fact that results are achieved not by calculations but by creative activity, which in industry is expressed in technological innovations. These complex problems cannot be left to themselves over the long run.

[Question] Thank you for the conversation.

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NEW MERITUM MINICOMPUTER PRODUCTION

Warsaw POLISH ECONOMIC NEWS in English 30 Apr 84 p 5

[Text] The Polonia enterprises operating in Poland are establishing new forms of contact with the state enterprises. An example of this is the cooperation in the production of minicomputers, where Polonia firms supply the construction studies, while the Polish electronic industry is the producer of this equipment.

It is in this way that the computer MERITUM, developed by the Polonia firm ITM in Cracow, is produced. The exclusiveness for its production was bought by MERA-ELZAB in Zabrze, a well-known producer of computer equipment.

The computer built is using the microprocessor Z-80, has a ROM memory with a capacity of 14 kB or RAM - 17 kB (in its expanded version 64 kB). After the connection of a normal television set and a casette tape recorder we get a mini-system programmable in an expanded version of the BASIC language.

MERITUM in its basic form is a personal computer, which can be used for scientific and technical research, editing of texts, programming instruction, educational games. It can also be used in industry as an industrial controller (after connection with a CAMAC mechanic block and using additional industrial input-output systems).

It is also possible to connect it through connectors to computer peripherals (read-out, perforator, printer).

Within the framework of a multi-year agreement with MERA-ELZAB, ITM is working on a broad application of MERITUM in industry. Its usage in metallurgy (heating processes control) and in the mining industry (power control in mines) has already been worked out. On the basis of MERITUM elements a cardiological analyser for intensive therapy units in hospitals, is being worked out.

ITM, offering services in programming, is authorized by MERA-ELZAB to make constructional changes in the computer according to buyers' requirements (special use).

A similar form of cooperation with the industry is used by IMPOL, a Polonia firm which deals with the development, construction and production of computer equipment as well as programming services. It has developed and is now producing the minisystem IMP 85. This computer uses the microprocessor INTEL 8085 and its

memory capacity is 64kB. Very varied programming is used here, amongst others, the most widely used operational system CP/M, BASIC interpretor, BASIC Compiler, FORTRAN Compiler, etc. With the use of connectors, the system can be expanded through peripherals (print-out, memory floppy discs, etc.).

In 1983 IMPOL sold the technical documentation and the right to produce this minisystem to the electronic equipment plants MERA-KFAP in Cracow. These plants along with IMPOL will produce this minisystem under its own name MK-4501. At the same time, in accordance with the cooperation agreement between both firms, IMPOL will supply during 2 years MERA-KFAP with 80 percent of the minisystems in parts ready for assembly. This will be done until MERA-KFAP masters its own independent production. The plans for 1984 foresee the delivery to MERA-KFAP of 200 units for assembly.

The minisystem is a business computer, which can be used for engineers' calculations, office, stock, finance and production codumentation data processing.

IMPOL has also developed and is beginning the production of the minisystem IMZ-80, with Z-80 microprocessor. This computer (with a memory capacity of 64 kB) can be connected to a normal television set. An additional module allows the connection of other equipment (for example, outside memory on floppy discs). The BASIC language is used for programming the computer. This model is comparable in its operational capabilities to computers Spectrum, Apple or Sharp.

CSO: 2020/93

SCIENCE POLICY, CRISIS, PROSPECTS, GAP DESCRIBED

Science Crisis

Warsaw ZYCIE WARSZAWY in Polish 11 May 84 p 3

[Interview with Prof Dr hab Wladyslaw Markiewicz, vice president, Polish Academy of Sciences, by Janina Paradowska: "Crisis of Science or of Scientific Policy?"; date and location of interview not given]

[Text] [Question] Recently I have noted a clearly growing wave of publications and statements regarding the crisis that the social sciences apparently are undergoing. Very strong statements are being made to the effect that these sciences are not keeping up with what is going on in the country, that they are not forecasting or offering future formulas. In your opinion, is this a valid criticism?

[Answer] This is not the first time that the crisis in the sciences has been discussed and written of. To begin with, this issue is brought up again and again by disheartened scholars themselves that in some cases are totally appalled by the meagre social effectiveness of the sometimes many years they and their professional colleagues spend doing costly and arduous research. For example, such theoreticians well-known in the social sciences as Andreski, Gouldner, Schelsky and Sontheimer have spoken out over recent years not merely on the crisis in the work of the sociological community, but on its complete downfall. Likewise in Poland during the 1950's, sociology was stamped as a bourgeois science. With this as a pretext it was liquidated. Shortly after being reinstated, it was warned from all sides in the famous discussion on the so-called mania for taking polls that it inevitably would go astray in the direction of primitive empiricism. Today sociologists are being accused of seeking escapes from reality in vapid theoreticizing.

To be sure, every discipline in the social sciences sphere, under certain circumstances, has been cast into the pillory of public opinion, frequently through the efforts of scholars themselves, and has been promised a lamentable end. This has occurred primarily when certain influential and sometimes modish and cleverly advertised schools and scholarly areas, have used up all the innovative elements found in them or have made known their real theoretical-cognitive emptiness. Meanwhile, other ostensibly innovative ideas did not yet manage to take their place. The work of V. Lenin on empirical criticism contains many enlightening and still current remarks on this topic.

[Question] But not only scholars are using the word "crisis" at present.

[Answer] The idea of the crisis in scholarship is cropping up somewhat spontaneously in a situation where all other fields of social life without exception are finding themselves in a collapse, and people are feeling hemmed in by dangers whose origin and essence they are not yet in a position to comprehend. Consequently, they are unable to overcome them. Even the most self-critical society is not inclined in such circumstances to take even part of the blame for the ensuing catastrophe and seeks the perpetrators of its misfortunes outside itself: it is not "we" but "they" that are responsible for everything. "They" are primarily the so-called decisionmakers or their advisers.

[Question] Is this a justifiable reaction?

[Answer] I do not think that this instinctive reaction is entirely unjustifiable and devoid of sense. In any case, rulers must be aware that the state's situation depends primarily upon them and not upon ordinary citizens, particularly if these average citizens are subjected to autocratic tendencies and are prevented from participating in the exercise of authority. On the other hand, science, through its interest in cognitive knowledge of the world, naturally performs advisory roles and lends expertise. Thus, scientists ought to recognize that they are participating in molding the country's future to an extent that is incomparably more significant than the role of their fellow Poles.

[Question] Does this mean that since science has failed to be very effective in averting the social crisis or in offering real assistance in overcoming it, apparently it is itself in danger of a deep decline?

[Answer] I do not agree at all with such a conclusion, since it obliterates the essential difference between science "per se" and scientific policy. Strictly speaking, the state of science is determined above all by intellectual potential at its disposal, i.e., specifically by the number of people that are outstandingly able, endowed with creative, inquiring intellect and, at the same time, are diligent and self-denying enough to preserve and enrich their own natural gifts. Therefore, one may speak of the crisis in specific disciplines in a double sense. First, it happens that during a certain period there is a dry spell for outstanding talent and certain branches of science begin to vegetate. This situation arose in Polish linguistics after the death of the real titans of this discipline (Doroszewski, Klemensiewicz, Kurylowicz, Lehr-Splawinski and Nitsch). This does not necessarily mean that at present this disicpline is highly inferior to world linguistics. Sometimes it takes a very long time to overcome such a crisis in science, and all preferential treatment given to the particular discipline with the general interests of society in mind can yield only temporary results. Second, there may be cases in which there are a large number of extremely capable people in a given scientific field able to be forerunners in scientific discoveries, but for whom the proper conditions have either not managed to be created or have not bothered to be created.

[Question] Then we are speaking not of a crisis in science in the literal sense but of a crisis in scientific policy.

[Answer] Yes, I maintain that with regard to the social-humanistic sciences we are dealing with the latter phenomenon, the crisis in scientific policy, in Poland. This means that we do not know how to make use of the tremendous stores of ability, intelligence, erudition and scholarly passion of scientists for the public good. Ordinarily throughout the world we fail to appreciate them and do not care about them. Clear evidence of this is the desperate state of the equipping of humanities research facilities and the pauperization of the scientific cadre. In indicating our faulty scientific policy as the source of the present crisis in our humanities, I do not wish to give the impression that I am biased against state elements, holding them alone responsible for the existing state of things that fills one with sadness. There is also no question but what scholars themselves do not take advantage of the opportunities provided by the quite considerable autonomy of scientific institutions and the prestige of the scholarly profession that, despite everything, still exists in society, to better the situation of science and to increase its participation in reforming public life.

[Question] Then we really are facing a crisis in the social sciences, even though one may conclude from your statements that the judgments made about its causes and signs thus far have been overly simplistic. Is it not possible that this quite widespread "crisis" feeling also emanates from the fact that the expectations of both the authorities and society in this area are just too grandiose? Are they perhaps expectations that science could never meet?

[Answer] As a matter of fact, all human expectations may be labeled "to grow on," depending upon the frame of reference that one chooses for them. Perhaps there are people in Poland that are inclined to take seriously and not metaphorically the announcement of the possibility for transforming Poland rapidly into a "second Japan" and that would make similar demands of science. Nor can I vouch for the fact that there are no scholars that take this slogan seriously. Nevertheless, the vast majority of our society, laboring beyond its capacities, limits its everyday desires to completely pedestrian issues that are basically very modest: life without queues, some sort of housing of one's own, efficient transportation, well-wishing officials and concerned superiors, readily available recreation facilities and the possibility of relaxation. The impossibility of meeting such basic needs creates fertile soil for the exuberant growth of all sorts of social weeds and for the growing wild of habits that also render everyday human existence odious. Can we blame society then for asking the question: why is this happening and what must be done to deal resolutely with these problems? A rather tragic circumstance in this situation is the fact that the social sciences have already responded long ago to many such questions, generally quite precisely and exhaustively, but their statements did not receive the hoped-for and desired response.

[Question] Of late it is being said often that science is silent about what may be done to remedy the present unfortunate situation, for example, on the issue of work quality.

[Answer] Thousands of studies have been done on the topic of work and the conditions that must be fulfilled to raise work quality. However, the analyses, the advice, the recommendations and even the assertive demands therein contained have had almost no influence on the practice of the operation of production enterprises, services facilities and offices. Not only does this show that we are failing to apply generally the results of scientific research due to organizational indolence, but also that we have not created in our system of work the economic, psychosocial and moral mechanisms for motivating people to enrich their knowledge continually. I must concede, however, that the scope of the dissemination of knowledge is sometimes limited because of the hermetic language used by the authors of scientific works. While it is true that every scholarly discipline, as it develops, increases the store of the specialized concepts that serve it as a tool for analyzing phenomena, many writers affect an artificial estrangement of style and their lectures are developed around a single guiding principle, so that the more incomprehensible the text, the more scholarly they appear.

[Question] The social sciences encompass a very broad sphere of research interests. Consequently, the degree of their impact upon the social consciousness is diverse, as is their responsibility.

[Answer] It is true that not all the sociohumanistic sciences have an equal impact upon the social consciousness. By virtue of the specific nature of the subject covered by some disciplines, one may say that they attack more directly the existential problems of individuals and human groups and perform political and ideological functions in a more direct way than the ostensibly natural fields of knowledge. On the other hand, if one remembers that culture is an integral whole within whose framework the particular segments of culture are mutually contingent upon each other and affect each other, then it is indeed difficult to point to a branch of the humanities that is free from responsibility for the way people think and the way they act in private and public life. There is absolutely no sense in starting an argument about which of the elements of culture in the broad sense is the more important and the more significant from the viewpoint of the harmonious functioning of society--economics, politics, law, history, art, pedagogy or the like. Certain social disciplines that pass as apolitical under "normal" conditions may become an extremely important tool in the political and ideological struggle under special circumstances. Such was the case with Polish archeology that battled for many years with German scholarship and its support of the "Drang nach Osten" campaign expressed through its biased theses about the forefathers of the Slavs.

[Question] Recently a meeting of the PAN [Polish Academy of Sciences] leadership was held in which the representatives of the highest political and state authorities took part together with Premier W. Jaruzelski at the head. Can this meeting help in some way to overcome the crisis in scientific policy of which we have been speaking?

[Answer] As PAN president Professor Jan Kostrzewski said, this meeting was unprecedented, if only in terms of the participation of government officials. In my opinion, it performed the task of building a sort of ark of understanding and alliance between science and the political and state authorities with regard

to defining the needs of science and the urgent necessity of preparing a concrete operating schedule of short- and long-range tasks for pulling science out of its crisis and for making scientific communities, particularly the humanities community, aware of their responsibility for the success of the great socioeconomic and political undertaking that is the reform, an undertaking that, according to Premier W. Jaruzelski, is essentially the work of scholars themselves.

Science Prospects

Warsaw ZYCIE WARSZAWY in Polish 16 May 84 p 3

[Interview with Prof Dr hab Zdzislaw Kaczmarek, PAN scientific secretary, by Bozena Kastory: "Science--Near and Distant Prospects"; date and location of interview not given]

[Text] [Question] Professor, recently a meeting was held between representatives of the Polish Academy of Sciences [PAN] and the country's political and state leaders. The chairman of the Council of Ministers, Army Gen Wojciech Jaruzelski and those that accompanied him were provided with an analysis of the state of science in Poland presented by PAN authorities. The decisions made during this meeting are of vital importance to the selection of the directions to take action in science and the material means for its development. What recommendations from the academy's analysis of the current state of science have become the foundation for future programs?

[Answer] The meeting of the Council of Ministers chairman with the PAN leaders was preceded by a fairly large number of preliminary discussions. In addition, we submitted a number of reports to the government leadership that contain our assessment of the state of science and our conclusions drawn therefrom.

Before the meeting was held, we discussed some of these issues with the interested ministries--the Ministry of Finance, the Ministry of Science, Higher Education and Technology, the Planning Commission and the like.

In this way, the decisions made regarding the directions for future activity were no accident, but the result of thorough analysis.

The materials we submitted and discussed during the meeting encompassed a broad range of questions. We covered a program for basic research, issues related to the use of scientific achievements by the national economy, issues of research organization, including setting up a Council for Basic Research and, finally, conditions for carrying out scholarship, i.e., the financial situation, wages, providing equipment, publishing houses and the like.

[Question] Let us begin with what is the subject of work in the sphere of science--the research program. Will it change? Frequently I hear people say that under the current financial situation it is impossible to continue in all our past efforts.

[Answer] When the current five-year plan began, the PAN leadership took the position that we should implement the research program prepared at the end of the previous five-year plan with the modifications that take into account both

the state of science and our potential. Twice we conducted discussions in interministerial commissions functioning within the basic research area. This had the purpose of making certain program revisions. However, all junctional and interministerial problems have been implemented. We do not expect to usher in any changes that would do away with the present system by the end of the five-year plan. It is very difficult to make sudden changes in scholarship. We have merely tried to restrict less significant, less important subjects.

[Question] Will the system of so-called junctional and interministerial problems be retained through 1986-1990?

[Answer] It probably will be necessary to modify it to some extent, not only because it is necessary to focus on the most important issues but also because research priorities are changing throughout the world.

[Question] This is understandable. Over the last 10 years, completely new research disciplines have grown up. But will the organizational structure of research and its division into problems coordinated by selected PAN institutes retain their present form?

[Answer] I am still not able to give a definite answer to this question. We are not certain what sort of system for organizing and coordinating research we should adopt. In the fall of last year, we prepared a definite proposal that we plan to implement. In the program, we wish to replace the current interministerial problems with two types of priorities. First, we would like to select a small number of research projects whose objective will be specified precisely. We would assign tasks in advance to research teams and would later verify these tasks. Beyond this, in such fields as mathematics, that does not lend itself to such assessments, we would introduce a system that I would call a competition for research initiatives. It would lead to granting scholarly communities in higher schools and PAN research centers subject grants for conducting research on selected topics. This system was not a Polish invention. It is a system known throughout the world of financing research in the form of grants, funds awarded for selected study proposals. The essence of the issue is based on creating good methods of selection that really would be effective, i.e., objective in the selection of projects coming in from the scientific community and also competent in their analysis.

[Question] The Polish Academy of Sciences coordinates basic research not only in its own institutes but also in other academic centers, for example, higher schools and economic ministries. Will this form of cooperation last despite financial difficulties that do not permit the designation of large sums out of the PAN budget for conducting research work outside the scope of PAN?

[Answer] With regard to the current five-year plan, in which we have extremely limited funding, we are still determined to retain this form of cooperation. We consider it to be very important. Between 1981 and 1983, within the framework of the problems for which the academy is responsible, we transfered more than 2.5 billion zlotys out of our budget to other ministries, chiefly to higher schools.

[Question] What percentage of PAN funds does this represent?

[Answer] It is 25 percent of all the monies at our disposal. Moreover, despite financial difficulties, we are prevailing upon the coordinators of research problems to be guided by the principle of selecting the best teams, i.e., in terms of subject matter, and not merely by concern for their own institute. This principle should continue to be observed.

[Question] At the meeting between PAN representatives and the state political and economic leadership, was there also discussion of preparations for changes in the management of the entire sphere of science and technology (preparations that have been underway for a long time without obvious results)? The creation of the Council for Basic Research of which you spoke was to be such a change, as were the Committee for Scientific-Technical Progress and certain modifications of tasks of the Ministry of Science, Higher Education and Technology.

[Answer] These issues were discussed in the preliminary statement given by PAN president, Prof Jan Kostrzewski. He reiterated the already stated PAN position regarding the implementation of organizational changes in guiding the entire field of science within as short a time as possible. This is not the first time that the academy has spoken out here in favor of the issue of a scientific and technical policy, for we believe that the possibility of economic development depends upon organizational and technological progress. Poland no longer has any other sources from which to draw its impulse for development than an increase in the efficiency of the use of national assets and labor productivity. Thus, we have once again come out in favor of creating an organ that would have the working name of the Committee for Scientific-Technical Progress.

[Question] I understand that this office would function outside the ministries.

[Answer] It would be an extraministerial organ that would have certain powers with regard to all ministries, PAN and the higher schools. These powers would consist of picking out the most important tasks in the sphere of applied research and the implementation of both broader technologies and technological progress. It would be funded primarily out of the technical-economic fund. As you know, these funds are partly under central distribution. It would make periodic assessments of how up-to-date our economy is. It would prepare a program of progress in the technological sphere and the like.

[Question] What would be the role of the Council for Basic Research?

[Answer] The council would be independent of this organ, since it would deal with a somewhat different sphere of problems. Our proposal (which was approved at the meeting between the chairman of the Council of Ministers and PAN representatives) is to create the Council for Basic Research as a qualified group responsible for inspiring the scientific community in this area, for the programing of basic research and for its financing.

[Question] Who would appoint this council?

[Answer] It would be appointed by the chairman of the Council of Ministers and would have representatives from the Academy of Sciences, the science ministry, higher schools, the Main Council on Higher Education and perhaps other ministries e.g., the Ministry of Health, which has a strong training and institutional base. We believe that this group, this council should assume such functions as those performed by the three interministerial Commissions for Basic Research that have been in operation over the past 7 or 8 years. The idea of the Council for Basic Research has the objective of ensuring the proper substantive level for directing such research: we would like it to be composed of eminent researchers. Secondly, we would like it to guarantee the objective assessment of research proposals and the later evaluations of the results of research. In this way, we would eliminate the fears that the topics coordinator may not be objective and may perceive in the main the interests of his own branch of scholarship.

[Question] Are these projects nearer implementation now than they were a year ago?

[Answer] I believe so. Personally I am convinced--although I may be wrong--since we still have no final decisions--that both the Committee for Scientific-Technical Progress and the Council for Basic Research will begin their work this year. I believe that this is necessary, for we must prepare an entire concept for research programs through the next five-year plan within the next year. Moreover, in the course of our discussion over the coming five-year plan we must struggle over granting science its proper position in the national economic plan.

[Question] In your opinion, what expectations do the political and economic authorities have of science?

[Answer] Their expectations are related primarily to the share of our own scientific and technological knowhow in resolving economic problems. The scientific community can demonstrate its knowledge in the form of scholarly advising, by preparing suitable reoprts for the needs of the government, the Planning Commission and the ministries. Secondly, the scientific institutes of PAN and higher schools and the ministerial institutes will conduct studies that should yield concrete, calculable results in the sphere of the production process, technology and production organization.

These are the normal expectations of political and state authorities, not only in Poland, but in all countries where extensive research is conducted.

[Question] Obviously the question arises of how to translate these expectations into the language of specific tasks assigned to science...

[Answer] This is very difficult, for at the present time, especially within the framework of economic reform, one expects initiatives to come not only from the central level but also from enterprises themselves. The experiences of the past 2 years, however, show that enterprises are not interested in making changes in the production process. They have many current problems and they do not wish to commit themselves to innovations without guarantees of success.

Every change involves a certain element of risk or the temporary limiting of efficiency. Consequently, we believe that these expectations of the authorities regarding science ought to be formulated by the ministries, by those that conduct economic policy. The ministries cannot do this without the cooperation of the leaders of enterprises. Mediation is necessary between production and science in the formulation of long-range tasks. Several years are necessary to resolve a scientific problem, and time is also needed for implementation. This tells us that today we must define research tasks from the viewpoint of the needs of industry as we move into the 1990's. The scientific community should take part in the process of formulating tasks for the national economic plan from the very stage of preparing its concepts.

[Question] Science is the only sphere of social activity for which state budgetary outlays have declined systematically over recent years. The PAN report prepared for the meeting with state authorities shows that in 1978, these funds represented 1.83 percent of the state budget, in 1982, they represented 1.25 percent and in 1984 they were only 1.02 percent of total planned state budgetary expenditures. Was the possibility of increasing funding for research given consideration?

[Answer] The academy was assured that the state authorities would attempt to improve the material situation of science, so that at the beginning of the next five-year plan (1986-1990), 2 percent of the national budget would be earmarked for science. This would increase gradually to 4 percent in the following years. In the third quarter of 1984, the Government Presidium will examine the entire picture of questions related to the system of wages in the sphere of science.

[Interviewer] Thank you for the interview.

Science Gap

Warsaw ZYCIE WARSZAWY in Polish 30 May 84 p 3

[Interview with Prof Wieslaw Grudzewski, dr of engineering, by Bozena Kastory: "It Will Not Turn Over"; date and location of interview not given]

[Text] [Question] Professor, as a research worker for many years and currently one of the experts making an analysis of the state of Polish technology for the Planning Commission, you have access to two types of information. First, you have access to data illustrating the state of the particular fields of technology in our country compared with worldwide standards; secondly, you are able to study information regarding the effectiveness of the economic mechanisms that were to motivate enterprises to modernize their production techniques and technology. In your opinion, do the principles ushered in by the reform enable the reduction of the technological gap between Poland and other industrialized countries?

[Answer] Let me first say a few words on the concept of the technological gap itself, whose assessment with regard to Poland I worked on together with a team of specialists from various fields. This is a very broad concept.

One may speak of a technological gap between the United States and the Soviet Union and vice versa, or between France and Great Britain, or between Italy and the FRG. Most Western countries are worried about the rate of development of Japan, which outstrips them in electronics, automation, robotics and other fields of technology.

[Question] Differences in development in the particular disciplines of technology are understandable. It would be difficult to imagine many diverse countries having an identical level of development. What is unfortunate, however, is the inferiority of technology by worldwide standards in many different fields within one country.

[Answer] A country like ours frequently must give way regarding the achievements of large international concerns that specialize in selected areas of technology. This gap always has existed and probably always will exist in our country.

There is only the problem of which are the specialties in which we have reached an average worldwide standard, which are those in which we could attain such a standard and which are those in which we will determine that the gap will occur and even will deepen.

[Question] Is it possible to state at this time that in some field, the distance dividing Polish technology from that of developed countries is frozen, that it is part of a program according to which we are better in some fields and in others we will decide to stay behind?

[Answer] Madam, the issue is very complex, since the planning and programing of development depends largely upon the external circumstances in which a given country finds itself. It is not only we that have failed in this area, but many Western states as well. It is not so much an issue of methods of prognosis as of experience--I would say, of one's nose, one's instinct and skill to sense what is important.

[Question] In what fields of technology is our gap with regard to other countries increasing, if unintentionally?

[Answer] A gap certainly exists in the area of electronics or, rather, in the electronization of the national economy, in automation, in the application of industrial robots and the like. On the other hand, our performance record is not bad in the production of mining equipment, power industry equipment and shipbuilding.

[Question] Professor, you spoke at a meeting with reporters on the methods of measuring our gap, in units of time, for example.

[Answer] According to such a measure, the distance calculated in years between the use of the RIAD-type computer in our economy and the IBM system is 24 years. The RIAD would be new for the beginning of the 1960's, and modern computer systems used today have completely new possibilities for data processing. Thus, our computerization gap exceeds 20 years if we take into consideration developments in Poland compared with those in Western countries.

[Question] What if we compare solutions used in Poland with applications in socialist countries?

[Answer] The GDR, Czechoslovakia and Hungary have made great progress.

[Question] Over a dozen years ago, this level was identical. How did our gap arise compared with countries with comparable resources, creative potential, economic systems and the like?

[Answer] Here the deciding factor is the implementation of the adopted programs as well as the level of application and use of computers.

[Question] Then it is not the shortage of computers?

[Answer] One could say that we have a shortage of computers; on the other hand, the potential that we possess is not being fully utilized. Computers should bring economic benefits, they should streamline the preparation for production and engineering calculations to make production cheaper and solutions more favorable from the viewpoint of the national economy.

[Question] Is there enough of such equipment now for enterprises to be able to learn to use it?

[Answer] There was a time when we had a fair amount of such equipment. However, we doubted that its utilization was correct in many cases. However, there are enterprises that cannot get along without computer systems, such as the Jelczan Truck Plant and the Zeran Automobile Factory.

[Question] Do they have computers?

[Answer] They do.

[Question] What models do they have?

[Answer] They have imported IBM-370's. They are very large and very accurate, and aid in steering technological processes, in management, making projections and making technical calculations.

[Question] If an enterprise in Poland wants a computer, what does it do? Does it purchase one?

[Answer] It may be ordered through the Polish firm ELWRO.

[Question] Then it is not purchased, but ordered? Does this mean a long wait?

[Answer] It is not that simple, since we are not producing many computers now. There is even a shortage of minicomputers.

[Question] Computerization in only one of the fields in which we lag behind, despite our initial opportunities for development. As you have said, the lag may be calculated in years or in the number of new technological solutions per the total number of inhabitants.

[Answer] In 1979, one patent was applied for in Poland for every 552 persons with a higher education. In the GDR this figure was one for every 421 persons, while in the United States, it was one for every 219 persons with a higher education. One patent was granted in Poland for every 12,000 persons employed, one was granted in Czechoslovakia per 5,000 employees and one was granted in Hungary per 1,000 employees.

[Question] A decline is also apparent in the number of ideas in this field over recent years. In 1980, we applied for 130 patents abroad, while in 1983 we applied for only 40. This is shocking.

[Answer] Yes, it is shocking. However, you must keep one thing in mind. In the FRG, one enterprise has existed for many years on the basis of 4 patents, despite the fact that over 20 new ones are applied for each year there. It is important that these patents be essential, technologically solid and that they produce economic results.

[Question] Is there any data to show that the 40 patents from 1983 are more valuable than the 130 applied for in 1980?

[Answer] We do not have such data, although such an analysis should be conducted systematically.

[Question] Are there any signs indicating that the interest of enterprises in introducing new technologies and products is on the rise?

[Answer] Enterprises do not always want to commit themselves to technological progress. Sometimes they prefer to make profit by manipulating prices, downgrading assortments and substituting raw and fabricated materials and even by restricting what goes into the products they produce.

[Question] The lack of funds alone, however, is not the only cause of the lack of inclination toward new technological solutions. In 1982, enterprises did not utilize 10 billion zlotys of the so-called technological-economic fund and in 1983, they did not use 6 billion zlotys of this fund. Where do the causes of this unwillingness lie--a fundamental resistance, since it is easier to even refuse the designated monies than to distribute them according to the stipulations of the law? How do you interpret this disinclination?

[Answer] The Fund for Technological-Economic Progress represents monies that are supposed to spur research in the field of technology. At best, however, the studies end with a pilot program or a trial series.

[Question] While they should end with new production methods...

[Answer] Here additional funds are needed for implementation.

[Question] Are there such funds?

[Answer] With regard to inventions or efficiency-improving solutions, enterprise working capital may be used and application costs may be included in production

costs. If enterprises require capital outlays, however, they must drawn upon their own development funds. These are not large and it appears that at present there is a shortage of funds for the implementation and dissemination of technological progress.

[Question] Professor, we do not exist in a vacuum. We have examples of the programing of technological development not only in countries with a different economic system and financial capabilities, but also in socialist countries. Can we not adopt the tested models, so as not to stop at the statement that enterprises are not interested in progress and that funds for capital spending are too small?

[Answer] It seems to me that in our country, two methods of proceeding should exist on an equal basis. First, conditions should be created so that enterprises will not be able to make a profit unless new technologies and technical solutions are used. But this can succeed only if there is competition, if monopolies are eliminated and under the principle of hard currency and normal market supply. Second, where such conditions do not exist, progress must be forced by the creation of facilitating factors--credits, tax reductions and even subsidies. Such a system has been adopted in many highly industrialized countries.

[Question] The recently introduced tax breaks were improperly conceived, since they do not lead enterprises to make innovations.

[Answer] Anti-import tax reductions should not have been introduced, since there are no funds for import anyway. Thus, technological anti-import solutions must be embarked upon apart from the incentives that are used, since this issue is the "be or not to be" for enterprises. Tax breaks should be given where other methods of stimulating development have no chance to succeed. Aside from this, at the state level, concrete research topics and specific applications should be chosen to aid the implementation of national economic plans.

[Question] Besides government orders, is there any other program of technological development coming into existence at the supra-ministerial level?

[Answer] Such programs should arise in enterprises or associations. Their purpose would be to improve products and modernize technology.

[Question] But we have already agreed that enterprises are not embarking upon new solutions. They do not have to, since they will sell everything anyway. True, they have funds for research, but they would still be lacking funds for implementation, since there is a shortage of funds for investment. Moreover, the completely prosaic lack of information prevents a comparison with the world average. Of the 30 new titles of periodicals that have begun to appear in the past 5 years throughout the world in the field of biotechnology, none reach Poland.

[Answer] Some copies do reach Poland. As for a program, thus far it appears that problems of a subsector or subbranch nature will be taken up by associations. But our experience in this area is still very slight.

[Question] And beyond associations? Are there any programs in which tasks would be assigned to subsectors or subbranches aimed toward their catching up to our socialist neighbors in 5 or 10 years? Is this not possible?

[Answer] I do not think we should make such free use of athletic terms here--"catching up" and "passing." We used them in the past. Now we must put it a little differently, i.e., what products do we want to put on the international market? In other words, what will our selection of export specializations be?

[Question] How is this selection determined?

[Answer] In many cases, the selection should be made in the enterprise based on economic reform mechanisms.

[Question] Should it arise on its own?

[Answer] It should be more or less spontaneous. That is why we brought in the reform. However, subbranch ministries also play a major role here.

* * *

From the editors: We would like to treat the proceeding opinions as the inspiration for a discussion on the subject of the degree to which technological progress under our country's present conditions can arise out of enterprise autonomy, and the degree to which it should be the implementation of a program arising at the government level--both central and supra-ministerial. The editorial staff will publish polemical statements in the future.

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BRIEFS

SERIES OF ELWRO-523 COMPUTERS--The first 25 Polish microcomputers ELWRO-523 have been assembled in a pilot batch at the ELWRO Electronic Plant in the industrial town of Wroclaw, southwestern Poland. In the last quarter of this year the plant plans to turn out 150 computers, 500 sets are expected in 1985, and some 1,000 annually in the years to come. The microcomputers mark a new stage in the history of the Wroclaw plant which this year celebrates 25 years of its existence. [Text] [Warsaw PAP DAILY NEWS in English 21 May 84 p 5]

CSO: 2020/93

DEVELOPMENT OF PHYSICS RESEARCH, APPLICATIONS

Bucharest MAGAZIN in Romanian 14 Apr 84 p 3

[Article by Mirela Roznoveanu]

[Text] Research, an integrated, multidisciplinary phenomenon. Romanian ideas and solutions, first nationally, competitive internationally. Relationship between applied research, fundamental research, and the national development plan.

The development of Romanian science following the liberation, and especially during the past two decades, has reached levels which at one time could not have been imagined. The process we are witnessing satisfies practical needs, as well as a natural tendency to fit into the world of international science. In modern society, science has actually become a true backbone without which progress cannot be imagined, and in which scientific research centers are veritable ferments for what is new. As we know, one of the most sensational disciplines in this respect, one which we might say has revolutionized the human concept of matter and the universe, is physics. From radioactivity and the theory of relativity, to theories about the structure of the atom and the interdependence of physical forces in the universe, and onward to space flight, nuclear reactors, laser therapy--to name just a few--physics has played a leading role in the outstanding discoveries of this century.

From Traditional Fields Toward Great Diversity

The first institute of physics in Romania was established in 1949, as part of the academy, in the commune of Magurele, where today we find an entire city of Romanian physicists. The institute of that time, as a research unit intended to develop the traditional fields created in universities, planned to investigate new areas of interest for Romanian science and technology in keeping with the development of science throughout the world. The institute opened veritable research worksites in physics, cosmic rays, electricity, heat, radioactivity, and theoretical physics. Following the development of installations and a growth in personnel, the institute fathered two others in 1956: the Atomic Physics Institute (IFA) and the Institute of Physics. In 1969, the higher party and state leadership approved the National Nuclear

Program for the comprehensive application of atomic energy in power generation, industrial branches, agriculture, medicine, the development of nuclear sciences, and associated areas. As part of the program, and in correlation with research into other scientific and technical objectives, the institutes developed a very strong material basis, trained specialists, and solved many research problems.

The National Physics Center (CNF) of Bucharest was inaugurated in 1974, at the initiative and on the basis of indications provided by Nicolae Ceausescu, secretary general of the party, who perceived it as an integrated center for research, design, and production, which would assign a large role to higher education. Five research units operate at this center, among which the School of Physics of the University of Bucharest, a mathematics and physics high school, and the Nuclear Instruments Plant. Housing has been built for the workers employed at this location, a boarding school for students, a new general education school, a shopping center, and a sports center, all of which form a huge site of Romanian research and industry; nearly 6000 people are currently studying, working, learning, and conducting research at Magurele.

In addition to the units in this national center (the Institute of Physics and Nuclear Engineering, the Institute of Physics and Material Technology, the Institute of Physics and Radiation Instruments Technology, the Center for Earth Physics and Seismology, the Center for Astronomy and Space Physics), the Central Institute of Physics (ICEFIZ), whose activity in physics and nuclear energy is dominant, consists of the Institute for Nuclear Energy Reactors at Pitesti, the Institute for Isotope and Molecular Technology at Cluj-Napoca, the Center for Technical Physics at Iasi and Cluj-Napoca, and physics departments in higher education schools. The institutes are endowed with modern installations for research activities, most of which are based on domestic ideas. Some of these installations are reactors, nuclear reactors, particle accelerators, laser and plasma facilities, electronic equipment, computers, and a wide range of laboratory devices.

The greatest portion of ICEFIZ's research capabilities is intended for achieving the objectives of the national nuclear energy program. Dr Ioan Brandus, scientific secretary of ICEFIZ, speaks about the national inventions of technologies for producing nuclear fuels for power plants from natural uranium, for producing heavy water, as well as of equipment for nuclear plants. ICEFIZ is also home for the general design of nuclear power plants and nuclear reactors. Physics, Dr Brandus tells us, developed from the party program guidelines for basing the country's development on technical and scientific progress. Indeed, the RCP Program for Building a Multilaterally Developed Socialist Society and Advancing Romania Toward Communism, a program which reflects the scientific thinking of the secretary general of the party, states: "The party consistently starts from the consideration that science is the primordial factor in contemporary progress, and that the multilaterally developed socialist society and communism can be built only on the basis of the most advanced conquests of science and technology."

Results to Benefit the National Industry

Physics contributes to the solution of important problems of immediate interest in the economy, through direct contracts with industrial centrals, plants, factories, combines, and so on. For industry, it formulates and implements physical methods and nuclear technologies, unconventional technologies based on physical processes and phenomena, instruments, installations, and equipment, as well as new materials with special physical and mechanical properties, and provides specialized technical assistance for their operation.

Among the unconventional technologies that are highly efficient in industrial processes, are the surface hardening of moving metal parts by ionic nitrification, ionic plating, boration, plasma heat treatments, electron beam techniques in vacuum, and laser microprocessing. To the extent of their priorities, ICEFIZ produces both the technologies and the installations necessary for them.

Some other achievements which reflect the interdependence of research and the needs of the national industry, are installations for non-destructive quality control of industrial products, using nuclear radiation and ultrasound, as well as instruments for physico-chemical analyses. The extraction industry (oil and geology) is provided with instruments and techniques for geophysical studies, and for analyzing the concentration of useful elements in ores. It can even be said that the institute in fact supplies instruments and methods to measure speed, density, concentration, levels, and so on, by means of radiation, for all types of industries, from machine construction, machine-tools, electronics, chemistry, metallurgy, transportation, and telecommunication. Some of the physical methods provided for these industrial branches are X-ray fluorescence analysis, nuclear magnetic resonance, electron spin resonance, optical spectroscopy, radioactive tracer analysis, and so on.

The institute's laboratories are searching for new materials with special physico-mechanical properties, to produce components and devices in microelectronics, electronics, aviation, nuclear energy, and so on.

One specific area consists of radioactive and stable isotopes, chemical products tagged with isotopes, and radiopharmaceutical products. The Center for Radiochemical Production operates in this field at Magurele, and pilot lines for the products mentioned above operate at Cluj-Napoca. Medicine for instance, uses radiation installations for diagnosis and medical treatment, and a Romanian medical betatron is currently being installed at Fundeni.

A method for determining the wear of furnace walls by tagging them with radioactive isotopes was patented as an original Romanian invention, which is being used at the Hunedoara and Galati steel combines, is requested by foreign users, and is applied by specialists at the Institute of Physics and Engineering in Taranto (Italy). Ionic nitrification installations are found at the Pitesti Automobile Enterprise, the Steagul Rosu plants in Brasov, and elsewhere. Nuclear technologies are intensively used in the extraction industry, such as the Baia Mare Mining Central.

A Constant Concern: Quality

One important area in this field is space research. We know that physics, technology, and biophysics experiments were designed, and then performed by the Romanian astronaut Dumitru Dorin Prunariu during his flight, and that other experiments have been formulated to simulate space phenomena and processes on the ground. Directing their telescopes toward the depths of the universe, astronomers are obtaining original data about the structure of the solar system, of our galaxy, and of other galaxies as well. The findings of Romanian physicists about the sun are applied for solar energy, meteorology, air and sea navigation, and medicine. Romanian seismologists in turn, are accumulating information about the structure and movement of the earth's crust, earth magnetism, and seismic geology, in order to find new raw material deposits. A problem of great interest is seismic prediction.

These many directions and important applications of physics and nuclear energy find a constant source in the results of fundamental research, which is itself oriented toward those areas that selectively concern the development objectives of the national economy and that will provide solutions in the near and long term future. The research thus covers nuclear physics, solid state physics, laser and plasma physics, the interaction of radiation and matter, as well as molecular and isotopic atomic processes. ICEFIZ units cooperate intensively with research, production, and education units in other branches of the economy, often working as joint research teams that share solutions, components, as well as scientific and technical information. At the same time, scientific and technical cooperation is being carried out with specialized institutes abroad, some of it as part of international programs. Notable among these are cooperations with institutes in USSR, China, GDR, Hungary, Czechoslovakia, Poland, Bulgaria, the United States, FRG, England, Belgium, and Dennmark. The institute participates in the activities of the Unified Institute for Nuclear Research at Dubna (USSR), the International Institute for Theoretical Physics at Trieste (Italy), and the Intercosmos space program. Romanian researchers take part in the activities of the European Physics Society, the International Union for Pure and Applied Physics, and the International Agency for Atomic Energy.

Our constant and special concern, we are told by Dr Brandus, is the technical and qualitative level of our performance, so that the research and production achieved at ICEFIZ will be competitive with similar work abroad. The importation of products, technologies, and licenses is avoided by encouraging creative scientific thinking, a subtle process which involves the full working capabilities and professional dedication of Romanian researchers, specialists, and scientists, thus continuing in a framework incomparably more appropriate than ever, the great traditions of our scientific knowledge. Looking at the magnitude of Romanian research, we can state that no problem raised by the nation's multilateral development can remain unsolved, and what is more, that we will succeed in finding for all of them original solutions, new ideas, and world class performances.

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